

GAO
Report to the Chairman, Subcommittee
on Defense Technology, Acquisition, and
Industrial Base, Committee on Armed
Services, U.S. Senate

September 1993

FOREIGN TECHNOLOGY

Collection and Dissemination of Japanese Information Can Be Improved



93-24537



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**National Security and
International Affairs Division**

B-254219

September 30, 1993

The Honorable Jeff Bingaman
Chairman, Subcommittee on Defense Technology,
Acquisition, and Industrial Base
Committee on Armed Services
United States Senate

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Background

U.S. government officials and industry representatives often cite Japan as a good example of a country whose government has played a key role in collecting, analyzing, and disseminating foreign technology information to both its industry and government. Among other things, such efforts have helped make Japan's economy the second largest in the world. After World War II, Japan solidified its technology base by importing foreign technology to supplement its own research and development efforts.

Japan's primary industrial technology agency is the Ministry of International Trade and Industry (MITI). MITI's mission is to further industrial research and development in Japan, and it has been active since the early 1960s in supporting Japanese industry. Despite these government efforts, many Japanese government officials and industry representatives

¹The "users" or "customers" of the information collected by these organizations are those individuals or groups, usually within the home agency, that the organizations' missions require them to provide the information to.

said that Japanese companies are the primary collectors of specific information on foreign technologies.

Current literature indicates that Japanese research and development capabilities have been growing stronger, and Japanese government industrial policies have been targeting knowledge-intensive technologies as well as substantially increasing government and industry investments in new technologies.² Japan has several efforts underway to create new technologies and products, including (1) developing special technology capabilities in areas, such as aircraft, that will position Japanese firms as key subcontractors or program partners in international programs³ and (2) combining existing industries such as biotechnology and energy. Many Japanese technological capabilities now match those of the United States and in some cases have surpassed U.S. capabilities.

Most U.S. firms have relied on indigenous technology for their industrial development. The U.S. government has not developed a focused system for collecting foreign technology information and disseminating it to industry and academia, despite their increasing interest in obtaining this information.⁴ Rather, the U.S. government's approach to monitoring foreign technology information is largely a result of its focus on military technology and supporting basic research and development. Several U.S. government organizations, most of which are defense-related, have offices in Japan to collect foreign technology information and disseminate it to their home agencies. These include the Defense Technology Office, the research offices of the three services, and the Environment, Science, and Technology Office in the American Embassy in Tokyo.

Results in Brief

The Japanese and U.S. governments' approaches for collecting and disseminating foreign technology information are organized and funded differently. The Japanese government has an extensive, centrally coordinated process and uses considerable resources to collect and disseminate foreign technology information primarily for commercial purposes. This process is characterized by (1) extensive networks

²Japan-U.S. Economic Issues: Investment, Saving, Technology, and Attitudes, Congressional Research Service (Feb. 2, 1990).

³David B. Friedman and Richard J. Samuels, "How to Succeed Without Really Flying: The Japanese Aircraft Industry and Japan's Technology Ideology," in Regionalism and Rivalry: Japan and the United States in Pacific Asia, J. Frankel and M. Kahler, eds. (Chicago, IL, forthcoming 1993).

⁴Some large U.S. corporations have established research and development operations overseas in order to monitor foreign technology information, and some companies obtain this information via consulting firms.

between officials and researchers in government, industry, and academia that provide information and (2) a methodical process of consensus building regarding what technologies should be monitored within a competitive, commercial framework. Experts collect information in specific areas of interest, which is targeted to the needs of the users, and then use extensive and multiple channels to disseminate the data. MITI facilitates and coordinates government, industry, and academic activities, including research and development programs and foreign technology information collection efforts, by providing technology information and significant funding for these activities.

The U.S. government, on the other hand, has a decentralized process that includes various civilian and defense agencies' offices and laboratories in the United States and overseas that collect information to support their differing missions. In 1990, we reported that 62 U.S. federal civilian and military offices and divisions within 6 departments and independent agencies monitor foreign technology information.⁵ We assessed 10 of the U.S. civilian and defense offices in Japan that collect and disseminate foreign technology information.⁶ The missions of the defense organizations, in particular, place little, if any, importance on providing information to industry and academia. Moreover, most of these U.S. government organizations in Japan are military-oriented, and most of the U.S. resources are expended by military activities. No central U.S. agency has a role similar to MITI's, and coordination among these U.S. civilian and defense offices is limited. Collectively, the U.S. government organizations in Japan have fewer resources than the Japanese government does in the United States for foreign technology collection and dissemination activities.

Japanese government and private sector officials stressed the importance of determining and providing the foreign technology information that customers want and need. Other elements of a successful system that they identified include (1) maintaining a cooperative government-industry relationship, (2) treating technology monitoring as an integral part of an

⁵Foreign Technology: U.S. Monitoring and Dissemination of the Results of Foreign Research (GAO/NSIAD-90-117, Mar. 21 1990). See also Foreign Technology: Federal Processes for Collection and Dissemination (GAO/NSIAD-92-101, Mar. 23, 1992).

⁶With a few exceptions, such as intelligence organizations, we assessed all of the U.S. government organizations in Japan that collect and disseminate foreign technology information. The Department of Commerce is not included in this study, since officials from its office in Japan, the U.S. and Foreign Commercial Service, told us that they do not collect foreign technology information to any significant degree.

organization's operations, and (3) locating operations in the target country.

Only a few of the 10 U.S. civilian government and defense organizations in Japan that we reviewed have reevaluated and revised their missions with regard to science and technology collection and dissemination to reflect changes in the international arena.⁷ Further, some of the U.S. organizations have not identified the demand for and usefulness of the information they collect and disseminate to potential customers in government, industry, and academia. To some extent, this problem also exists regarding the organizations' current, mostly internal agency customers. In addition, the U.S. organizations' efforts are limited by the lack of (1) coordination of activities among the various civilian and military offices and (2) appropriate background and language skills for some of the information collectors.

The Japanese and U.S. Governments Have Different Approaches for Collecting and Disseminating Foreign Technology Information

The Japanese government plays a more significant and intense role in guiding the national research and development effort for economic competitiveness than the U.S. government. In addition, Japan spends a lot of money to collect, analyze, and disseminate foreign technology information to its government, industry, and academia. MITI (1) establishes organizations that carry out specific research and development programs; (2) provides funds (subsidies) and/or information, such as data on foreign technology policy and research capabilities, to government and private sector organizations for research and development projects; (3) coordinates government-industry policies, for example, by routing information toward those who will benefit from it; and (4) facilitates technology diffusion and transfer.

The Japanese government primarily collects foreign technology information through MITI-sponsored organizations. In response to requests from government organizations, industry, and academia, the Japan External Trade Organization (JETRO), MITI's primary information collection organization, collects foreign technology information through its extensive network of offices in Japan and overseas and disseminates it to requesters

⁷One organization that has changed its mission is the Asian Office of Aerospace Research and Development. Officials from the Air Force Office of Scientific Research told us that the mission of the Asian Office, which was recently reestablished in Tokyo, has been changed to include monitoring more applied technology, which may be useful to industry, as well as the basic technology that they have traditionally focused on.

primarily for commercial purposes.⁸ Overall, JETRO has 1,200 staff in a total of 107 offices worldwide. About half of the staff is located in its 31 offices in Japan, with the other half in 76 offices in 57 countries. The Japanese government provided about \$182 million towards JETRO's fiscal year 1992 budget. JETRO officials told us that they could not identify the amount of additional funds that JETRO receives from private sources. JETRO employs 187 staff in 8 offices located throughout the United States, but JETRO officials told us that they could not determine the total budget for these offices. However, through other sources, we found that JETRO's New York office alone has an annual budget of \$8 million and 80 staff. JETRO's staff is supplemented by staff from several other government and industry organizations.

According to both Japanese government and private sector officials, however, private companies in Japan, not the Japanese government, are the primary collectors of specific information on foreign technologies.⁹ They said this is true particularly for large firms, such as Nippon Electronics Corporation, that have extensive, in-house capabilities to monitor and disseminate foreign technology information within the company. A State Department official told us that U.S. and foreign firms can operate relatively inexpensively in the United States, compared to operating in Japan. According to a U.S. Embassy official, Japanese businessmen are voracious consumers of technical information. In addition, the Japanese government and private sector have relatively easy access to U.S. technology information, because (1) many Japanese, including scientists and engineers, speak and read English and (2) much of the U.S. research and development is done in an open university system.

In contrast, the U.S. government has not developed an extensive, centralized system for collecting and disseminating foreign technology information. Total staff and budget figures for U.S. government organizations that collect and disseminate foreign technology information worldwide are not readily available. There are 62 civilian and military offices and divisions within 6 departments and independent agencies that monitor foreign technology information. U.S. efforts are primarily oriented toward the military in terms of the number of organizations and the way resources are expended. Seven of the 10 U.S. government organizations in

⁸To advance its overall mission to support trade between Japan and other countries, JETRO also promotes imports in Japan, industrial cooperation, and international exchange.

⁹Japan also has networks of related companies and financial institutions, called keiretsu, that provide a means for information exchange as well as risk-sharing and mutual problem-solving. See Competitiveness Issues: The Business Environment in the United States, Japan, and Germany (GAO/GGD-93-124, Aug. 9, 1993).

Japan that we assessed were military organizations, and about 72 percent of the U.S. funds are spent for these military activities. The U.S. civilian and defense organizations in Japan have from 1 to 32 staff members working on foreign technology collection and dissemination activities. A total of 86 U.S. personnel are working on such activities at these organizations in Japan. The organizations' fiscal year 1992 operating budgets ranged from \$301,000 to \$1.06 million and totaled \$6.2 million.

In February 1993 testimony,¹⁰ we stated that a host of federal offices and laboratories in the United States collect information on foreign science and technology. The organizations collect and assess the information for different purposes, which are determined largely by their missions. Although the U.S. Department of Commerce is the closest counterpart to MITI,¹¹ neither it nor any other U.S. agency performs MITI's role of coordination. In addition, cooperation among the U.S. organizations that collect and disseminate foreign technology information is not currently required. As a result, cooperation among the U.S. civilian and defense organizations in Japan is limited.

Although it is not part of their mission, some U.S. government organizations in Japan also provide the information that they collect to industry and academia. Other U.S. organizations, primarily intelligence organizations, restrict access to their analyses. Although U.S. experts have reported increased interest in foreign technology information by U.S. companies, they said that many companies still do not actively seek out this type of information on their own or through consultants. According to a U.S. electronics industry association representative, the companies often do not recognize the strategic value of the information and, therefore, are unwilling to pay for it. Even for those companies that are interested in obtaining the information, setting up foreign technology collection operations is very costly, particularly in Japan. Only a few large U.S. corporations have such operations in Japan. In addition, the U.S. government and private sector have difficulty obtaining access to Japanese technology information, since (1) many Americans do not speak or read Japanese and (2) much of Japan's research and development is done in industry laboratories.

¹⁰Science and Technology: Federal Efforts to Collect and Analyze Information on Foreign Science and Technology (GAO/T-RCED-93-8).

¹¹Japan-U.S. Economic Issues: Investment, Saving, Technology, and Attitudes. Congressional Research Service (Feb. 2, 1990).

U.S. and Japanese government and private sector organizations have similar techniques for collecting and disseminating foreign technology information, although the Japanese perform these activities on a much larger scale. Representatives of U.S. and Japanese organizations attend symposiums and international conferences, collect technical literature, visit laboratories and individual scientists, and participate in or sponsor international researcher exchanges and collaborative research and development efforts. Japanese officials emphasized that establishing and maintaining informal networks with other Japanese and foreign scientists was useful. U.S. and Japanese officials use journals, reports, newsletters, databases, facsimiles, and workshops to disseminate information.

Japanese Views on the Elements of a Successful System

Japanese government and private sector officials cited four elements that they believe contribute to a successful system for collecting and disseminating foreign technology information: (1) targeted data collection, (2) a cooperative government-industry relationship, (3) treatment of foreign technology monitoring as an integral part of their operations, and (4) establishment of operations in the target country.

Targeted Data Collection

One important element of an effective information collection and dissemination effort cited by the Japanese is that it be demand-driven. In other words, the needs of the users of the information must be identified and met in order to be successful. For example, JETRO regularly uses inquiries to survey its customers' needs and determine the best dissemination method. JETRO, among other activities, gathers information for private companies on technologies and markets, based on specific requests for information, in much the same way that a consulting company would tailor information to a client's strategic and operational needs.

In contrast, the majority of the U.S. government organizations in Japan have not identified the demand for and usefulness of the information they collect and disseminate to potential customers in government, industry, and academia. To some extent, this problem also exists regarding their current, mostly internal agency customers. For example, the Environment, Science, and Technology Office in the American Embassy has not recently done research to identify customer and potential customer needs as well as the appropriateness of its reporting format.

A study done by a large Japanese consulting company suggested that the U.S. business and scientific communities are not interested in Japanese

technology information, even if it is provided in English.¹² According to an Embassy official, this lack of a demand-pull from U.S. industry may explain why the U.S. government has a relatively small effort to provide such information. Department of Defense (DOD) officials told us that U.S. companies may not be interested in the information collected by government organizations because much of the information is not analyzed. However, a U.S. company official said that U.S. companies may not solicit this type of information from the U.S. government because they do not want to indicate which technologies they are interested in. In fact, according to a National Technical Information Service official, some large companies purchase the Service's entire database tape and do their own issue searches to hide their specific area of interest.

A Cooperative Government-Industry Relationship

According to Japanese officials, the Japanese government and industry have a very effective government-industry relationship that contributes to the flow of foreign technology information among various organizations. Officials from a U.S. company agreed with this observation. In addition, Japanese company officials said that one of their most useful methods of obtaining information is participating in government-sponsored research and development projects where several Japanese companies are involved.¹³

A State Department official told us that there is a more cooperative government-industry relationship in Japan than in the United States, because the Japanese government does not restrict the flow of information to the private sector as much as the U.S. government does. He said that the Japanese government has fewer security and copyright restrictions on information due to its more informal process of disseminating information. For example, the Japanese government provides information to Japanese industry associations that condense and repackage the information. According to the official, U.S. industry associations are not usually as focused on collecting and/or disseminating such information, but are primarily concerned with lobbying the Congress and the executive branch.

¹²Scientific and Technical Information Transfer Between Japan and the United States, Mitsubishi Research Institute (Oct. 1992).

¹³Officials from a U.S. company said that foreign technology information is also obtained from negotiating a coproduction agreement, even when the company decides not to do the project. Coproduction is overseas production based on government-to-government agreement that permits a foreign government or producer to acquire the technical information to manufacture all or part of a U.S.-origin defense article.

Integral Part of Operations

Another effective element cited by the Japanese is that organizations treat foreign technology monitoring as an integral part of their operations. Rather than having separate, specific offices for this activity, researchers, scientists, and others throughout the organizations monitor foreign technology information. For example, the Japanese research and development consortium for superconductor technology expects all its researchers to stay abreast of foreign technology developments in their field as part of their work. In contrast, the U.S. Semiconductor Manufacturing Technology consortium (SEMATECH) has one separate office that collects foreign technology information and disseminates it to its internal programs and member companies. However, according to a SEMATECH official, U.S. government and private sector organizations generally cannot rely on scientists and engineers to collect foreign technology information on their own, since many do not have Japanese language skills and some of the technical information is only available in Japanese. Therefore, SEMATECH's foreign technology collection office routinely works with its internal and external customers to ascertain their information needs.

Operations Located in the Target Country

According to representatives from a Japanese company, one of the best foreign technology information collection methods is to use a research/consulting firm located within the target country. In addition, foreign partners and subsidiaries often can provide information on operations in other countries. U.S. company representatives told us that their company's affiliates in Tokyo observe foreign technical developments as they occur and thereby serve as an important part of their foreign technology monitoring system. However, many U.S. companies do not have affiliates or foreign technology monitoring operations in Japan largely because of the high cost.

Evaluating Missions in Enhance the Effectiveness of U.S. Government Organizations in Japan

Our review showed that the U.S. civilian government and defense organizations in Japan that we reviewed were not operating as effectively as they could. Many of the organizations' missions do not reflect changes that have occurred in the international arena, such as technological advancements in Japan and the end of the cold war. Further, some of the U.S. organizations have not identified the demand for and usefulness of the information they collect and disseminate to potential customers in government, industry, and academia. To some extent, this problem also exists regarding the organizations' current, mostly internal agency customers. In addition, the U.S. organizations' efforts are limited by the

lack of (1) coordination of activities among the various civilian and military offices and (2) appropriate background and language skills for some of the information collectors.

Figure 1 shows the different missions of the U.S. civilian government and defense organizations in Japan as well as their funds, staff, and reporting requirements.

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Figure 1: U.S. Government Organizations in Japan That Collect and Disseminate Foreign Technology Information

Defense					
Office	Defense Technology Office (DTO)	Defense Attaché Office	Office of Naval Research Asia (ONRASIA)	Army Research Office - Far East (ARO-FE)	Asian Office of Aerospace Research and Development (AOARD)
Mission	<ul style="list-style-type: none"> 1. Identify and disseminate commercial technology with potential defense applications 2. Facilitate DOD access to Japanese technology 3. Promote cooperative development 	<ul style="list-style-type: none"> 1. Represent DOD 2. Monitor information on Japanese defense forces 3. Counsel ambassador 	<p>Monitor basic science and technology information of interest to the Navy in Pacific Rim^a countries</p>	<p>Monitor basic science and technology information of interest to the Army in Pacific Rim^a countries</p>	<p>Monitor basic and applied science and technology information of interest to the Air Force in Pacific Rim^a countries</p>
Budget for fiscal year 1992^b	\$301,000	\$632,500	\$1 million	\$500,000	<\$1 million ^c
Number of staff	4 program managers	17 total, including 5 attaches 12 administrative staff	9 total, including 4 scientists 5 administrative staff	1 scientist (uses ONRASIA administrative staff)	3 scientists increases planned: 1 additional scientist 1 administrative staff
Formal reporting channels	<ul style="list-style-type: none"> 1. Office of Secretary of Defense 2. Under Secretary of Defense (Acquisitions)-International Programs Office 3. U.S. Commander in Chief, Pacific Command 4. Ambassador 	<ul style="list-style-type: none"> 1. DOD 2. Ambassador 	Office of Naval Research	Army Research Office	Air Force Office of Scientific Research

Defense (cont.)		Civilian		
Science and Technology Center Far East	Air Force Detachment 1	Environment, Science, and Technology Office	National Science Foundation (NSF)	Department of Energy
Monitor science and technology information and research and development in Pacific Rim ^a countries	Monitor and access aerospace science and technology information in Pacific Rim ^b countries	<ul style="list-style-type: none"> 1. Manage interests of U.S. technical agencies 2. Handle environmental policy 3. Address nonproliferation issues 4. Monitor science and technology information 	<ul style="list-style-type: none"> 1. Collect information on Japanese science developments and science policy 2. Act as a liaison in NSF programs with the Japanese government 	<ul style="list-style-type: none"> 1. Represent interests of Energy and the government 2. Advise the ambassador when requested
\$1.06 million	Not available	\$875,000 ^c	\$404,000	\$490,000
32 total, including 13 technical staff 19 administrative staff	Not available	11 total, including 7 science officers 4 administrative staff	5 total, including 1 scientist 4 administrative staff	4 total, including 3 technical staff 1 administrative staff
Army Materiel Command	Wright-Patterson Air Force Base	<ul style="list-style-type: none"> 1. State Department 2. Ambassador 3. Project STRIDE 	<ul style="list-style-type: none"> 1. NSF 2. Ambassador 	<ul style="list-style-type: none"> 1. Department of Energy 2. Ambassador

Note: This does not include U.S. intelligence efforts in Japan.

^aPacific Rim countries include Japan and China.

^bThese figures were reported by each organization and may not be comparable.

^cThe upper bounds of the budget was \$1 million if all planned staff were hired. They were not.

^dThis figure is an estimated cost for fiscal year 1993. A figure for fiscal year 1992 was unavailable.

Failure to Reevaluate and Revise Missions

Due to the important foreign technology and policy developments and increased technological capabilities overseas, many U.S. government and

private sector officials recognize that foreign technology information is often a key element to strengthening the economic competitiveness of U.S. industries. Some officials suggested that the U.S. government could help by providing useful, unclassified foreign technology information to users in industry and academia. However, the traditional federal role has focused on military technology development and is generally limited to supporting basic science and mission-oriented research in various federal agencies. In addition, since the U.S. government has focused on military technology, most of the U.S. organizations in Japan that collect and disseminate foreign technology information are defense organizations that place little, if any, importance on providing information to industry and academia.

Lack of Research on Customer and Potential Customer Needs

The primary missions of the U.S. organizations in Japan are to respond to their individual agency needs, and these needs are being identified and met, at least to some extent, with regard to their current, mostly internal agency customers. The organizations are (1) identifying the general technical areas that need to be monitored and (2) evaluating how useful some of the information is to their customers. For example, the Office of Naval Research annually reviews one-third of its technical programs, including assessing the information that its foreign offices in Japan and Europe are disseminating. The Office of Naval Research held a one-time Peer Review in 1992 to evaluate the effectiveness of its foreign offices' science and technology information collection efforts. As a result of this review, several aspects of its foreign offices, such as how they are staffed, will change. In addition, an Army Research Office official told us that some of the U.S. organizations in Tokyo perform assessments in response to the needs of their customers. For example, a number of U.S.-Japan workshops have been organized on issues of direct interest to DOD research laboratories.

However, although some organizations' approaches to identifying and addressing customers' needs appear to be more effective than others, little information is available regarding the specific needs of the organizations' current, internal agency customers. For example, some of the organizations have not done research to identify the most effective reporting format or channels.

Some organizations also disseminate information to industry and academia on their own initiative. The Office of Naval Research's Asian Office in Tokyo is responsible for studying, assessing, and reporting to the

Office of Naval Research on basic science and technology developments in Japan and other Asian countries. A scientist in this office has developed a list of interested customers in government, academia, and industry and uses electronic mail to quickly and inexpensively disseminate information on Japanese developments in computer science and technology. According to university researchers, this information is valuable and may not be easily available otherwise.

However, the U.S. organizations have generally not identified the demand for and usefulness of the information to potential customers in government, industry, and academia. For example, the Embassy Environment, Science, and Technology Office disseminates foreign technology information to users in industry and academia via Project STRIDE cables.¹⁴ A 1988 report prepared for the National Science Foundation, State, and Commerce concluded that industrial research and development managers believed this information had limited value.¹⁵ In addition, military officials told us that the STRIDE cables are difficult to read due to their format. In our February 1993 testimony, we stated that there may be reason for caution in efforts to provide foreign technology information to industry and academic organizations because the usefulness of this information to them has not been determined.

Lack of Coordination Between Civilian and Military Organizations

Although coordination among these civilian and defense organizations is not required,¹⁶ U.S. Embassy officials in Tokyo told us that cooperation would be beneficial because it would (1) provide an opportunity to share information and limited resources, (2) offer the potential to reduce unnecessary duplication, and (3) help to establish a coherent foreign science and technology policy. For example, U.S. military officials in Japan told us that the Environment, Science, and Technology Office in the Embassy is an institution highly respected by Japanese industry with whom they have developed working relations to promote U.S.-Japan technology exchange. This office's assistance could help U.S. military

¹⁴Project Science and Technology Reporting for Information Dissemination Enhancement (STRIDE) is a mechanism used by State, Commerce, and the National Science Foundation for disseminating science and technology information developed abroad to users in federal laboratories, academic institutions, and the private sector on a fee-for-service basis through Commerce's National Technical Information Service.

¹⁵William D. Guns, Catherine P. Ailes, and Damian M. Saccoccio, Project STRIDE: S&T Reporting for Information Dissemination Enhancement, SRI International (STPP-TN-3164-5, Aug. 1988).

¹⁶The National Defense Authorization Act for Fiscal Years 1992 and 1993 requires the Secretary of Defense to establish the Office of Foreign Defense Technology Monitoring and Assessment to help coordinate defense-related foreign technology monitoring activities. The Defense Intelligence Agency is the lead agency in establishing this office.

offices in Japan establish contact with the Japanese science and technology community, since the community, reflecting the views of the larger Japanese society, has not been receptive to U.S. military representatives.

Some U.S. organizations, such as the three services research offices, are cooperating by sharing information and coordinating staffing requirements; however, according to U.S. Embassy and DOD officials, efforts initiated by the Embassy Environment, Science, and Technology Office to share information, such as biweekly meetings, have encountered several problems. For example, Embassy and DOD officials said that because the civilian and defense offices have differing missions and reporting requirements that, in some cases, restrict dissemination of the information even among other federal offices, many of the military participants are non-communicative during the meetings and some relevant military officials do not attend. In addition, a U.S. military official in Japan told us that his organization has not been invited to these meetings. According to an Embassy official, it is not surprising that no central federal agency is responsible for coordinating the collection of foreign technology information because of the organizational distinction between the civilian agencies and defense and intelligence agencies.

Lack of Appropriate Background and Language Capabilities

U.S. officials that we interviewed in Japan had differing perspectives regarding the appropriate background needed for a staff member to effectively collect foreign science and technology information. Several of the U.S. officials in the civilian and defense organizations that collect foreign technology information in Japan do not have a technical background, such as science or engineering. U.S. Embassy officials told us that collectors who do not have a technical background can adequately collect general technology information used for policy decisions. However, officials from the defense organizations said that, when collecting and assessing technical information, experts are needed to comprehend the relevance and implications of technical developments and provide more detailed information useful to researchers and scientists. A U.S. Embassy official in Japan told us that the information would be of better quality if those without a technical background and the technical experts worked together to collect and assess the information.

Many of the officials collecting information for the U.S. government efforts in Japan also do not have Japanese language capabilities. U.S. officials told us that this lack of language skills poses problems when collecting

technology information in Japan, since much of the most important technical information in Japan is available only in Japanese. In fact, DOD officials told us that it is difficult to find U.S. scientists and researchers who have foreign language capabilities; however, a DOD official told us that his agency is beginning to address the problem by providing education and training in Japanese language, culture, and management and business practices to U.S. scientists, engineers, managers, and students.¹⁷ According to the DOD official, an effective short-term solution may be to enable U.S. organizations in Japan to hire staff with Japanese language skills to assist technical staff who lack these skills.

Recommendations

We recommend that the Secretaries of Defense and State, in consultation with the Secretary of Commerce, reevaluate the missions of their offices that monitor and disseminate foreign technology information in Japan in light of global economic and technical changes.

We also recommend that these offices in Japan be required to

- determine through sample surveys/evaluations
 - the information needs of their customers and potential customers;
 - how well they are addressing these needs; and
 - how they can improve the usefulness of the information collected as well as their reporting formats and methods of dissemination;
- coordinate and cooperate with other U.S. government organizations in the various federal agencies and laboratories that are monitoring and disseminating foreign technology information to make the best use of the federal resources that are being spent on these activities; and
- hire or train staff with the appropriate background and language skills needed to effectively collect foreign technology information and/or assign teams of technical and nontechnical staff as well as staff with and without language skills to maximize staff capabilities.

Our scope and methodology are discussed in appendix III.

We performed our review between February 1992 and July 1993 in accordance with generally accepted government auditing standards. As requested, we did not obtain agency comments on this report. However,

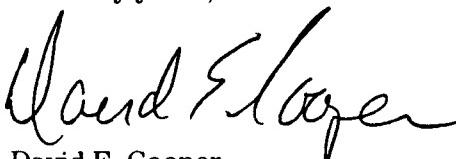
¹⁷The United States-Japan Industry and Technology Management Training Program is being conducted by the Air Force Office of Scientific Research on behalf of DOD. Eight universities have been funded in merit-based competitions since fiscal year 1991 to increase DOD's understanding of Japanese technology management methods.

we discussed our findings with program officials from DOD, State, and Commerce as well as U.S. private sector officials. They generally agreed with our findings. We have included their specific views where appropriate.

We are sending copies of the report to the Chairmen, Senate and House Committees on Armed Services and the House Committee on Science, Space, and Technology. We will also make copies available to others upon request.

Please contact me at (202) 512-4587 if you or your staff have any questions concerning this report. Major contributors to this report are listed in appendix IV.

Sincerely yours,



David E. Cooper
Director, Acquisition, Policy,
Technology, and Competitiveness Issues

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Abbreviations

AOARD	Asian Office of Aerospace Research and Development
ARO-FE	Army Research Office, Far East
DOD	Department of Defense
DOE	Department of Energy
DTO	Defense Technology Office
JETRO	Japan External Trade Organization
JTEC	Japanese Technical Evaluation Center
MITI	Ministry of International Trade and Industry
NSF	National Science Foundation
ONRASIA	Office of Naval Research, Asia
SEMATECH	Semiconductor Manufacturing Technology consortium
STRIDE	Project Science and Technology Reporting for Information Dissemination Enhancement

U.S. Government Organizations in Japan That Collect and Disseminate Japanese Technology Information

This appendix discusses the efforts of 10 U.S. government organizations in Japan to collect and disseminate Japanese technology information.

The 10 U.S. government organizations that collect technology information in Japan we reviewed, including 3 civilian and 7 defense organizations, have diverse missions and differing reporting requirements, but have similar approaches to collecting and disseminating foreign technology information. Although some organizations provide raw data, some provide analyzed information, and others provide both. The organizations have experienced similar difficulties in obtaining access to Japanese technology information. Officials from each U.S. organization provided the following information.

Environment, Science, and Technology Office

The Environment, Science, and Technology Office in the American Embassy in Tokyo is funded by the State Department's East Asia and Pacific Bureau. It has several missions, including (1) managing the interests of U.S. technical agencies, (2) covering nuclear nonproliferation, (3) covering environmental policy and cooperation, and (4) collecting information on Japanese science and technology developments and disseminating it to policymakers at the State Department. According to an official from this office, environmental policy and cooperation probably takes up more time than any other concern.

Although disseminating information to industry and academia is not a formal task of the Environment, Science, and Technology Office, helping U.S. businesses to compete is one criteria that the State Department now uses to evaluate all staff for promotion. The Office in Tokyo disseminates the foreign technology information that it collects to government and nongovernment decisionmakers via Project STRIDE. The science officers determine on a case-by-case basis what technology information should be provided through STRIDE. For example, a recent STRIDE cable included information on the joint development by Nippon Electronics Corporation and AT&T of a 64-megabit direct random access memory contact formation technique.

The total cost for the Environment, Science, and Technology Office for fiscal year 1993 is estimated to be \$875,000. The Office has seven science officers and four foreign service nationals who provide administrative and logistical support as well as contacts to the Japanese community. Two of the science officers have technical backgrounds and three are fluent in

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Japanese.¹ A science officer told us that foreign policy generalists can do adequate analyses of technological developments, even though such analyses would be enhanced if they worked side by side with technical experts.

The science officers determine what technology information to collect based on (1) information reported in the Japanese press, (2) specific State requests, and (3) trends identified during the course of their work.² Information is primarily collected by monitoring developments reported in Japanese—mostly English language—newspapers and other publications, such as the Science and Technology Agency's monthly bulletin, STA Today. Some publications and information are received directly through the Japanese government. When addressing a specific request, the science officers will occasionally collect information on specific technology developments by telephoning or visiting Japanese companies or government laboratories. Information is disseminated via cables.

According to a science officer, for the most part, the Environment, Science, and Technology Office does not have a problem getting access to Japanese technology information. However, because some of the science officers cannot read Japanese or are not fluent in the language, they cannot closely monitor documents that are only written in Japanese. According to the head of the Office, the main problems his staff faces are (1) disseminating STRIDE information to industry via the National Technical Information Service, which is not as effective as it should be since it does not have sufficient funds, and (2) the lack of interest in foreign technology information on the part of U.S. industry.

**ational Science
oundation - Tokyo**

The National Science Foundation's (NSF) Tokyo office is located in the American Embassy. NSF provides funds for science-related programs and projects. Some of the Tokyo office's many functions include (1) collecting information on Japanese science policy and developments and (2) acting as a liaison/intermediary in the many NSF programs with the Japanese government, public corporations, and industry. For example, the NSF Tokyo Office provides support for the U.S. scientists and researchers working and studying in Japan under NSF fellowship programs. In addition, the office provides support to the Japanese Technical Evaluation Center (JTEC) panels during their visits to Tokyo.

¹According to a State Department official, two positions in the Environment, Science, and Technology Office are now designated as requiring Japanese language fluency.

²According to a science officer, they learn what information is important.

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The fiscal year 1992 budget for the nsf Tokyo office was \$404,000. The office has one scientist and four Japanese administrative staff to assist him in reporting information to NSF headquarters in Washington, D.C. The scientist normally serves a term of at least 2 years. The Office's current scientist has Japanese language skills that enable him to discuss science-and technology-related matters with Japanese government officials as well as make presentations in Japanese.

The nsf Tokyo Office has several science policy issues that it routinely monitors, including the budget and future projects of the Ministry of International Trade and Industry (MITI). In addition, the Office receives direct requests from NSF offices in Washington, D.C. The scientist uses his own discretion to determine what additional information should be collected.

The scientist collects science information by monitoring government documents and Japanese newspapers and other publications that are available in English as well as attending conferences and meeting with Japanese government and private sector officials. Information is disseminated to NSF through internal reports and memorandums. NSF offices then incorporate the information into their own reports and documents that are available to the public via the National Technical Information Service. The nsf Tokyo office also provides information directly to the Environment, Science, and Technology Office for its STRIDE cables. Other than through the National Technical Information Service, neither NSF nor the Tokyo office has an established mechanism for providing information to U.S. industry.

According to the nsf Tokyo office scientist, obtaining information on Japanese research is relatively easy, since, in the past 5 years, Japanese government agencies have been producing more English language brochures outlining the types of projects they are doing and the amount of funds devoted to those projects.³

**Department of
Energy - Tokyo**

The Department of Energy (DOE) has an office located in the American Embassy in Tokyo to represent and service all Energy program offices with interests in Japan as well as to advise the Ambassador on energy-related matters. The office has regional responsibility for all Energy program interests, such as materials and service sales, national laboratory

³U.S. and Japanese officials told us that a time lag can occur between the time a Japanese document is published in Japanese and the time it is translated and made available in English.

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programs, and researcher exchanges. The Tokyo office reports to the Department's Office of Domestic and International Energy Policy.

The DOE Tokyo office's operating budget was \$490,000 for fiscal year 1992, and it has three technical staff, one of which is a U.S. official who heads the Office, and one administrative staff. The head of the office has a technical, business, and economic background and has Japanese language skills. The rest of the staff is Japanese.

The DOE Tokyo office collects technical information for Energy program offices and laboratories that may also assist U.S. industry to export goods and services to Japan. Staff collect information on Japanese energy developments by monitoring Japanese literature and through regular contacts with officials from the government, scientific, academic, and private sectors. Staff also meet with Japanese officials from agencies, such as MITI, the Ministry of Foreign Affairs, and the Science and Technology Agency to discuss U.S. energy projects, agreements, and Memorandums of Understanding with the Japanese government, academia, and private sector.

According to the head of the DOE Tokyo office, staff do not experience problems obtaining technical information in Japan.

Defense Technology Office

The Defense Technology Office (DTO) is part of the Mutual Defense Assistance Office in the American Embassy in Tokyo. The Mutual Defense Assistance Office is responsible for maintaining liaison among Department of Defense (DOD) components in Japan, the appropriate elements of the U.S. diplomatic mission, and Japanese defense organizations.⁴ DTO's mission is to (1) identify Japanese technology with potential defense applications and disseminate this information to DOD organizations, laboratories, and defense contractors; (2) facilitate DOD access to Japanese technology through government-to-government and government-to-industry liaison; and (3) pursue cooperative arrangements with the Japan Defense Agency to develop technologies that benefit both U.S. and Japanese defense acquisition programs. DTO also orally or via memorandums provides the information that it collects to the Departments of Commerce and State. DTO relies upon these agencies to identify potential commercial technology applications and, where appropriate, to pass this information on to industry.

⁴DOD 5105.38-M.

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DTO's fiscal year 1992 budget was \$301,000. The Mutual Defense Assistance Office has 17 total staff, 4 of which are DTO staff. The DTO staff includes a director and one staff from each of the three services. These staff are primarily program managers that have little technical expertise yet maintain industry contacts. Two of the staff have Japanese language capabilities, and the Mutual Defense Assistance Office has a full-time interpreter. For technical expertise, DTO staff depend on visiting experts from DOD organizations and scientists from the three services' research offices in Tokyo. There is a Memorandum of Understanding, dated March 6, 1992, between these offices to promote cooperation among them and provide supplemental technical support to DTO when needed.

DTO uses the list of technologies identified in the annual Defense Critical Technologies Plan as well as other DOD technical assessments to determine what technologies to monitor. Information is primarily collected by (1) doing technology assessments⁵ to determine Japan's technical progress and direction and (2) performing database investigations to monitor technical developments. DTO also facilitates technology flowback to the United States through coproduction Memorandums of Understanding and the Joint Military Technology Commission.⁶

According to DTO officials, DTO has several difficulties in collecting and disseminating foreign technology information. DTO's director told us that it is difficult to find a U.S sponsor that can incorporate the Japanese technologies into their operations or products. In addition, DTO officials said that it is difficult to convince Japanese companies to transfer their commercial technologies to the United States for military applications, because they believe the commercial application of the technology will be classified or restricted, limiting its use in the commercial sector. However, according to the Mutual Defense Assistance Office's chief, typically only the military application of the technology is classified. DTO's director also said that technical skill and expertise are needed to recognize valuable technologies with the potential to be integrated into a U.S. company's products or processes.

⁵These assessments are developed by visiting experts from DOD organizations and staff from the Office of Naval Research - Asia, the Army Research Office - Far East, and the Asian Office of Aerospace Research and Development.

⁶The Joint Military Technology Commission serves as the means for consultations between the U.S. and Japanese governments in identifying Japanese technologies with military applications that can be transferred to the United States. The Japanese government component of the Commission has the authority to grant the approval of exports of military technology to the United States. Commission membership includes Japan's Ministry of Foreign Affairs, MITI, and the Japan Defense Agency as well as the U.S. Mutual Defense Assistance Office and the U.S. Embassy. No military equipment is exported.

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Defense Attache Office

The Defense Attache Office in the American Embassy in Tokyo is a diplomatically accredited triservice DOD organization. The Defense Attache Office's mission is to monitor and report on the capabilities of the Japanese military defense forces. Specifically, this includes (1) collecting and reporting military and military-political information, (2) representing DOD and the U.S. military in Japan, and (3) advising the Ambassador on military matters. The Defense Attache Office also does some liaison and coordination work, hosting U.S. DOD and military visitors in Japan.

The Defense Attache Office's budget, which is provided by DOD rather than the State Department, was \$632,500 for fiscal year 1992. The five diplomatically accredited military/defense attaches do not have technical backgrounds but have some degree of Japanese language capability. There are also 12 administrative personnel in the office in Tokyo, 7 of which are foreign service nationals. The defense attaches are overt military information collectors. The Defense Attache told us that the small staff is fully occupied in addressing its primary collection mission.

The Defense Attache Office is tasked by DOD to collect both general and specific technology information. However, the office primarily monitors Japanese defense policy, strategy, and operations as opposed to raw technology information. The defense attaches collect this information through open sources, such as Japanese newspapers or government publications, as well as frequent meetings with Japan Defense Agency and military officials. The defense attaches do not analyze the information that they obtain, but report the information directly to DOD. All information is classified.

According to Defense Attache Office staff, they have experienced difficulties in collecting technology information in Japan due to language differences and cultural reticence. They said that although language is not an insurmountable barrier to obtaining information, because much of the Japanese information is published in English, Japanese language capability increases an individual's access to information. In addition, because of the Japanese culture, the staff must be known and accepted by their Japanese contacts and establish some credibility before the Japanese will provide information.

Office of Naval Research - Asia

The Office of Naval Research established an Asian Office (ONRASIA) to study, evaluate, assess, and report on basic scientific developments of interest to the Navy in Japan and other Asian countries. ONRASIA,

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co-located in Hardy Barracks in Tokyo with the other two services' research offices, is responsible for (1) gaining insight into foreign research and development and projecting future objectives of U.S. competitors, (2) understanding foreign technical motivation and goals, (3) producing timely technology assessments and evaluations, (4) providing contacts/linkages between U.S. and foreign science and technology communities, and (5) fostering technology transfer.

ONRASIA's budget for fiscal year 1992 was approximately \$1 million, including salaries, travel expenses, and office support services. ONRASIA currently has four liaison scientists, who are assigned to the office for up to 3 years; one visiting scientist; and five support staff. The liaison scientists are required to be active senior researchers from government, industry, or academia with an excellent publication record and good contacts in Japan and other Asian countries. One of the scientists has Japanese language capabilities.

The scientists determine what technology information to collect based on their personal expertise in a technical area. In addition, occasionally, specific information is requested by the Office of Naval Research or another customer. The scientists primarily collect foreign technology information by (1) visiting laboratories and individual scientists, (2) attending technical meetings and conferences, (3) organizing and/or sponsoring science and technology workshops, (4) monitoring literature, and (5) providing direct linkages between the Navy and U.S. science community and those in Japan and other Asian countries. Some of the information is analyzed/assessed by the scientists and is disseminated to customers in the Office of Naval Research, DOD laboratories, and other DOD research organizations. The scientists develop a list of customers in their own individual areas of expertise, which may include users in industry and academia. Information is disseminated via (1) the Office of Naval Research's quarterly publication, the Scientific Information Bulletin; (2) electronic mail; (3) personal communications, such as letters, facsimile, or telephone calls; (4) meetings and workshops; and (5) papers, articles, and special reports.

The Office of Naval Research evaluates the effectiveness of the science and technology information collected by its foreign offices in Europe and Asia as an integral part of its annual review of one-third of the organization's technical programs. Information collected by the foreign offices is evaluated based on feedback from Office of Naval Research scientific officers as well as customers of the information in Navy

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laboratories and the U.S. technical community. The Office of Naval Research also performed a one-time peer review of its foreign offices in 1992 to evaluate the effectiveness of these offices' science and technology information collection efforts. As a result of this review, the Office of Naval Research is restructuring its foreign offices to improve the value of the information to the customer. For example, both the technical areas to be assessed as well as how the assessments are done will be determined by Navy program managers responsible for the relevant technical areas. In addition, an Office of Naval Research official told us that the office plans to use a wide range of scientists and engineers from Navy laboratories, industry, and academia to perform these focused assessments.

According to ONRASIA officials, their military affiliation is somewhat of a problem in collecting technology information in Japan because of the Japanese reluctance, especially those in academia, to share information with military officials. Efforts to overcome this problem include staffing the office with well-known scientists who have published several papers and have established good contacts in Japan. Other problems experienced by ONRASIA scientists include outdated monitoring and dissemination technologies or methods, lack of Japanese language skills, and lack of understanding of the Japanese culture.

Army Research Office - Far East

The Army Research Office established a Far East office (ARO-FE) to collect information and report on the latest developments in basic science relating to the particular needs of the Army. Located at Hardy Barracks in Tokyo, ARO-FE is responsible for (1) identifying major technology developments, trends, and opportunities in Japan and other Asian countries and disseminating this information to Army scientists and other DOD personnel; (2) promoting the exchange of information and collaboration between Army scientists and scientists in Japan and other Asian countries; (3) supporting Army laboratories and scientists by arranging for Army scientists to visit foreign laboratories and sponsoring technical meetings, conferences, and workshops of interest to the Army's research and development program objectives; (4) working closely with other U.S. organizations that collect and disseminate foreign technology information; and (5) providing technical support to DTO.

ARO-FE's operating budget was about \$500,000 in fiscal year 1992. The office currently has one liaison scientist who has some Japanese language capability. ARO-FE also invites scientists to visit the office and uses ONRASIA's support staff. According to ARO-FE's liaison scientist, the Army

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Research Office plans to increase ARO-FE staff between 1993 and 1995 to four liaison scientists, three to five rotational scientists, and one support staff.

The ARO-FE liaison scientist informally determines what technology information to collect based on his past experience working in Army laboratories, biannual visits to these laboratories, and specific requests from Army scientists. Information is primarily collected by (1) visiting Japanese laboratories, (2) participating in or organizing/sponsoring international symposia/workshops, (3) sponsoring and facilitating researcher exchanges, (4) sponsoring collaborative programs and special studies with other U.S. organizations such as ONRASIA, and (5) monitoring technical literature. The scientist analyzes the information that is collected and provides a technical assessment to Army laboratories, other DOD organizations, and industry via electronic mail, facsimile, or regular mail. The scientist also collaborates with ONRASIA scientists on articles published in the Office of Naval Research's Scientific Information Bulletin.

The ARO-FE scientist told us he faces problems getting access to Japanese technology information, because many Japanese academics and some government officials are unwilling to share information with military researchers. He also said that this is a barrier in transferring dual-use technology to the United States. In addition, the scientist said that he has difficulty persuading U.S. scientists to visit Japan, because (1) Japanese laboratories are not well regarded in the United States and (2) DOD scientists are not encouraged to work in them.

Asian Office of Aerospace Research and Development

The Air Force Office of Scientific Research has recently reestablished an office in Japan, the Asian Office of Aerospace Research and Development (AOARD), to collect information on basic and applied science and technology developments related to Air Force needs and disseminate this information to Air Force laboratories and other DOD organizations. Specifically, the office's mission includes (1) monitoring science and technology activities in Japan and other Asian countries; (2) assessing defense-critical technologies, within its capabilities; and (3) facilitating the transfer of appropriate science and technology to Air Force laboratories. Secondarily, AOARD plans to (1) act as a liaison to the Air Force and DOD science communities, (2) coordinate and facilitate visits with Air Force personnel, and (3) provide technical support to DTO.

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The upper bounds of AOARD's budget was \$1 million in fiscal year 1992, including mission and support funds; however, AOARD's director told us that he expected to use only a fraction of that figure, because all planned staff had not been hired. The office is currently staffed with three scientists/engineers who have strong Japanese language skills and extensive technical experience. The director is authorized to hire an additional scientist/engineer and an administrative staff person. The director told us that he would also like to obtain authorization to hire two Japanese nationals to serve in secretarial and technical support positions.

AOARD's planned approach to the collection of foreign technology information includes (1) participating in selected conferences and workshops; (2) visiting academic, government, and industry laboratories; and (3) helping to initiate cooperative programs between U.S. and Japanese research and development organizations in key technical defense areas. AOARD staff maintain regular contact with U.S. aerospace industry representatives in Japan. AOARD reports to the Air Force Office of Scientific Research on a biweekly basis and provides periodical topical reports, synopses of conferences, and observations on Japanese government and corporate research and development policies. The Air Force Office of Scientific Research plans to begin evaluating AOARD's effectiveness late this year based on the technical excellence of the information that is collected and its relevance to customers' mission needs. The effectiveness of the information will be determined by top leaders from the Office of Scientific Research and Air Force laboratory chief scientists.

AOARD's director told us that he has experienced several problems in recruiting scientists for the new office, largely because of the different culture and language. Although the director said that a lack of Japanese language skills is not a major barrier to collecting technology information in Japan since many Japanese speak English, he believes that language skills would clearly enhance the scientists' ability to carry out their mission. The director also told us that the antimilitary sentiment in Japan could be overcome if the information collector is an expert and has established a name in the scientific community.

**Army Science and
Technology Center
Far East**

The Army Science and Technology Center Far East, located at Yokota Air Force Base in Tokyo, Japan, is part of the Army Materiel Command. The Center is responsible for supporting DOD's research and development and acquisition programs, with a particular emphasis on scientific and

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technical developments of interest to the U.S. Army and national research and development and materiel acquisition management organizations.

The Science and Technology Center's budget for fiscal year 1992 was \$1.06 million. The Center currently has 1 commanding officer and 32 civilian and military staff, including 13 technical staff and 19 administrative support staff; about half are Japanese nationals who serve as liaison coordinators and interpreters. Technical staff, who are experts with an advanced degree in their field and generally serve a 3-year tour of duty, are paired off with Japanese nationals who have been at the Science and Technology Center for 5 to 10 years. According to Center officials, the Japanese nationals are the key to obtaining access to Japanese companies because they provide information on the Japanese culture and continuity to the Center's staff.

Science and Technology Center staff collect and sometimes translate information on emerging technologies from countries throughout the Pacific Rim and disseminate this information to the services as well as DOD laboratories and other organizations through reports. Information is collected by (1) monitoring open sources, such as newspapers, journals, databases, and government publications; (2) attending symposia, trade shows, and conferences; and (3) meeting personally with bench-level scientists in Japanese government and private sector laboratories. According to Center staff, they report raw data to DOD since they do not have the time or training to analyze the information they collect. DOD has a formal feedback process through which about 15 percent of the Center's reports are evaluated based on the quality and usefulness of the information provided.

According to Center staff, although they collect a great deal of information in Japan, they have experienced problems in obtaining both basic and applied technical information, since (1) Japanese university officials will not share basic research information with military-affiliated personnel and (2) advanced research is mostly proprietary because it is done primarily in industry laboratories.

**Air Force
Detachment 1**

Air Force Detachment 1 is located at Yokota Air Force Base in Tokyo, Japan. Detachment 1 is responsible for collecting scientific and technical information in the Pacific theater as well as providing direct support to unified and Air Force component commanders to satisfy scientific and technical information requirements of operational units in their theater of

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operations. In addition, Detachment 1 staff (1) collect, assess, and disseminate information on performance characteristics, vulnerabilities, and capabilities of foreign aerospace weapon systems, subsystems, and related support components; (2) evaluate and provide assessments of trends and projections for technologies, processes, and products; (3) prepare, train, and maintain readiness to meet wartime mission responsibilities; and (4) provide planning assistance, coordination, and support to operational commands.

U.S.-Sponsored Organizations in the United States

This appendix discusses the efforts of two U.S. government-sponsored organizations located in the United States to collect and disseminate Japanese technology information.

The Japanese Technical Evaluation Center

The Japanese Technical Evaluation Center (JTEC)¹ is funded by the National Science Foundation (NSF), in cooperation with other agencies, to assess the status of trends of Japanese research and development in selected technologies, such as advanced computing, high temperature superconductivity, and material handling. Other agencies, such as the Advanced Research Projects Agency, the Office of Naval Research, the Department of Energy, and the National Aeronautics and Space Administration, have funded or cofunded JTEC studies through NSF. JTEC's mission is to (1) assess whether Japan is ahead of or behind the United States in certain technologies and (2) identify Japanese research and development strengths as targets for technology transfer back to the United States as well as opportunities for cooperation between the two countries.

JTEC operates under a standard research grant from NSF, and its grant funds have averaged about \$844,000 per year over the past several years. This spending level is expected to remain roughly constant through fiscal year 1994. JTEC has four full-time staff, but the NSF provides additional support staff as well as meeting facilities.

For the most part, JTEC has competed for funds from individual program offices throughout the government that need foreign technology information to run their programs and have a budget to pay for the information. This guarantees that the results produced have ready customers, and, as an additional benefit, many other users get the same information.

The process of identifying technologies for JTEC studies is carried out in a bottom-up fashion. In many cases, program officers in various research and development agencies throughout the government come to JTEC with proposals or suggestions for studies. These proposals are considered by JTEC and NSF, in conjunction with an advisory body of outside experts, to determine which requests meet JTEC criteria. About three in four proposed

¹JTEC is part of Loyola College's (Maryland) global initiative, the International Technology Research Institute. The Institute oversees (1) JTEC; (2) the World Technology Evaluation Center, which assesses the technical capabilities of countries in Europe, the former Soviet Union, and Canada; and (3) the Transportation Technology Evaluation Center funded by the U.S. Department of Transportation.

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studies are done because they are appropriate for the JTEC format. JTEC then puts together a small group of potential sponsors who try to agree on the scope of the study and identify a panel chair.

JTEC's technical assessments are performed by panels of six to nine U.S. technical experts in each area. Panel members, which are selected from industry, academia, and government, are leading authorities in the field, technically active, and knowledgeable about Japanese and U.S. research programs. Panelists spend about 1 month reviewing technical literature on the subject and then spend an intensive week conducting extensive tours of Japanese laboratories. According to JTEC and NSF officials, their organizations' reputation and good standing with the Japanese allow JTEC panels good access to Japanese government and private sector laboratories.

Although it has been suggested that JTEC maintain a permanent office in Japan to monitor day-to-day developments in Japanese technology and assist in planning JTEC panel site visits, JTEC staff told us that (1) this could easily cost millions of dollars and (2) it is unlikely that JTEC could recruit the high caliber of people that serve on JTEC panels to serve in such an office, even for short periods of time. In addition, JTEC staff said that they maintain a close relationship with the Office of Naval Research's Asian Office, which maintains a permanent presence in Tokyo.

Within 6 to 8 weeks after the site visits, the panels present draft conclusions at a public workshop in Washington, D.C. JTEC clients, policymakers, press, and a targeted list of industry representatives and academic researchers are invited to attend these workshops.² In the months following the workshop, panelists draft the final report, which is reviewed by JTEC and NSF as well as by the Japanese hosts. JTEC's Senior Advisor told us that this review process to ensure accuracy makes it difficult to get reports out more quickly. A JTEC official said that some JTEC sponsors have found the workshop more valuable than the final report, primarily because of its timeliness. The report is given to workshop attendees, sponsors, panelists, and the Japanese hosts. Until recently, JTEC had 800 copies printed of each report. JTEC distributed about 200 of these to a preestablished list of interested clients and sent about 100 for distribution through the National Technical Information Service. The remaining copies of the report are available to interested parties through JTEC.

²Two of the workshops have been videotaped and are available for purchase through JTEC. These include the JTEC workshops on (1) Japanese Space Robotics and (2) Advanced Manufacturing Technology for Polymer Composite Structures in Japan.

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Overall, support for JTEC and NSF as its lead agency has been positive, but some U.S. officials have criticized several aspects of the program. According to a senior official in the American Embassy in Tokyo, JTEC provides quality studies on cutting-edge technologies and has obtained good access to Japanese laboratories; however, its dissemination is limited. In addition, some agency officials have indicated that although JTEC studies appear to be affordable when they are cofunded by a few agencies, they can be expensive for one agency to fund. For example, an Air Force official told us that his organization chose not to use JTEC because it was too expensive to fund (on average about \$180,000 per study) and not timely enough (on average about 1.5 years per study). According to JTEC's Senior Advisor, JTEC studies cost less than comparable studies performed by the National Academy of Sciences or various private sector organizations. In addition, he told us that about 50 percent of the cost of a JTEC study includes (1) the cost of sending panel members to Japan for a week and (2) the honoraria paid to the panel members. JTEC feels that both of these are necessary costs, because they contribute to the high caliber of the panel members and quality of the resulting information.

JTEC and NSF held a workshop in May 1991³ to (1) develop a better understanding of client needs, (2) establish relationships between government agencies that need this type of information, (3) strengthen JTEC and other programs to better serve the science and technology community, and (4) define better methods for information dissemination. As a result, JTEC has efforts underway to speed up report processing and increase the dissemination of its reports to government, academia, and industry. For example, JTEC has developed a list of audiences and potential audiences for its information and is experimenting with different promotion ideas for their workshops. Through substantial investments in advertising and increasing their mailing lists, JTEC has recently increased attendance at workshops to over 200, compared to last year when it rarely exceeded 100. In addition, JTEC has increased its print run to 1,000 on its latest report on knowledge-based systems, compared to 300 2 years ago, and has distributed over 3,000 executive summaries for each of its 3 most recent reports.⁴ JTEC is examining the possibility of increasing the distribution of its executive summaries by using a professional society or commercial publisher.

³According to the Senior Advisor, JTEC is currently undertaking a critical review of various aspects of the JTEC program as a follow on to this workshop and the 1992 NSF-supported review, "Study on the Distribution and Use of JTEC-Related Information."

⁴Display Technologies in Japan (June 1992); Material Handling in Japan (March 1993); and Satellite Communications in Japan (July 1993).

SEMATECH

SEMATECH is a research and development consortium of U.S. semiconductor manufacturing firms that receives one-half of its funds from the U.S. government.⁵ SEMATECH has established the Competitive Analysis Group within the consortium for collecting, analyzing, translating, and disseminating foreign, primarily Pacific Rim, technology information to its internal organization as well as its member companies.⁶ SEMATECH's Competitive Analysis Group has 10 staff members; 1 member fluently speaks and reads Japanese. The other staff members have engineering backgrounds. According to a staff member, since this office collects detailed technical information, an engineering background is essential to understand and analyze the data. In addition, the staff member told us that foreign language skills are also essential since much of the best Japanese technical information is not available in English.

Although the department monitors all available foreign data, its staff discusses specific needs with its internal groups and works on joint research projects with its member companies. Information is primarily collected by monitoring databases, newspapers, magazines, and government reports as well as periodically visiting Japan and other Asian countries to meet with foreign officials and attend international technical symposia and conferences. According to a staff member, if SEMATECH had an office in the Far East, the Group could maintain an ongoing relationship with information sources and, therefore, more effectively collect technology information. However, establishing an office overseas is cost prohibitive, and SEMATECH believes that many of its member companies already have a sufficient presence in Asia.

Based on the needs identified, the office provides timely information regarding (1) what the competition is doing; (2) where the competitors are going with a technology, process, or product; and (3) what steps should be taken to remain competitive in that technology, process, or product. This information is disseminated to projects within SEMATECH and member companies through a variety of reporting methods, including reports, analyses, meetings, and translations. According to a SEMATECH official, this information can change the way SEMATECH project leaders and member companies think about their competition and plan their research and development strategies.

⁵See our most recent report on SEMATECH, Federal Research: SEMATECH's Technological Progress and Proposed R&D Program (GAO/RCED-92-223BR, July 16, 1992).

⁶Each of SEMATECH's member companies has a Competitive Analysis Group that meets quarterly with SEMATECH's group. According to a SEMATECH staff member, this network is effective in coordinating and disseminating foreign technology information.

Scope and Methodology

In reviewing U.S. and Japanese organizations that collect and disseminate foreign technology information, we interviewed and obtained documents from knowledgeable officials at the Departments of Defense, State, and Commerce. In Tokyo, Japan, we interviewed over 90 representatives of 27 U.S. and Japanese civilian government, defense, and private sector organizations that collect and disseminate foreign technology information. We selected these organizations based on information obtained from knowledgeable U.S. officials and industry representatives. We interviewed 10 of the 11 U.S. government organizations in Japan that monitor and disseminate foreign technology information.¹ We also reviewed a document produced by the Central Intelligence Agency, but did not include the Agency's activities in our review.

We assessed the efforts of the U.S. and Japanese organizations that we met with based on five factors: amount of funds, number of staff, official mission, relationship with home government, and efforts to coordinate with other organizations. The U.S. and Japanese companies that we interviewed did not provide specific funding information.

We also interviewed representatives of several U.S. consulting companies that monitor Japanese technology information as well as a university professor that has written extensively on Japanese technological and industrial developments. We attended a conference entitled "Targeting Research and Development for Competitive Advantage" that was sponsored by the American Foreign Service Association. In addition, we interviewed (1) a scientist at the Los Alamos National Laboratory that worked at Japan's International Superconductivity Technology Center under an agreement between these two organizations and (2) officials from the National Science Foundation, the Japanese Technical Evaluation Center (JTEC), and the Semiconductor Manufacturing Technology consortium that are responsible for foreign technology information collection and dissemination. We also attended a JTEC workshop.

We interviewed officials from the following U.S. and Japanese organizations in Japan:

U.S. Organizations

- American Electronics Association
- Air Force Detachment 1
- Army Research Office, Far East

¹We did not interview officials of the Naval Science and Technical Group Far East due to time constraints.

Appendix III
Scope and Methodology

- Army Science and Technology Center, Far East
- Army Science and Technology Translation Unit
- Asian Office of Aerospace Research and Development
- Defense Attache Office
- Department of Energy
- Environment, Science, and Technology Office
- Mutual Defense Assistance Office, Defense Technology Office
- National Science Foundation, Tokyo Regional Office
- Office of Naval Research Asia
- U.S. corporation²
- U.S. and Foreign Commercial Service

Japanese Organizations

- The Institute of Physical and Chemical Research
- International Superconductivity Technology Center
- Japan Electronics Industry Development Association
- Japan External Trade Organization
- Japan Information Center for Science and Technology
- Japan Key Technology Center
- Japan Research and Development Corporation
- Ministry of International Trade and Industry
- Mitsubishi Research Institute
- National Center for Science and Information Systems
- New Energy and Industrial Technology Development Organization
- Nippon Electronics Company
- Science and Technology Agency

²Officials from the U.S. corporation we interviewed agreed to provide information on the condition that their company not be named in our report.

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